

WHAT IS CLAIMED IS:

1. A solid oxide fuel cell stack formed of repeating cell units, each cell unit comprising:

    a solid oxide fuel cell having an anode side and a cathode side;

    an anode side frame;

    a cathode side frame;

    a bipolar plate having an anode side interconnect adjacent to the anode side frame and a cathode side interconnect adjacent to a cathode side frame of an adjacent repeating cell unit;

    a cathode side seal between the fuel cell and the cathode side frame; and

    an anode side seal between the fuel cell and the anode side frame, wherein at least one of the anode side interconnect, cathode side interconnect, anode side seal and cathode side seal are compliant.

2. The solid oxide fuel cell stack of claim 1, wherein the anode side interconnect and the cathode side interconnect are compliant in three dimensions.

3. The solid oxide fuel cell stack of claim 1, wherein each of the anode side interconnect, cathode side interconnect, anode side seal and cathode side seal are compliant.

4. The solid oxide fuel cell stack of claim 1, wherein the anode side frame and the cathode side frame define openings within which fuel cells are held.

5. The solid oxide fuel cell stack of claim 4, wherein the openings have a size of at least about 4 inches by 4 inches.

6. The solid oxide fuel cell stack of claim 4, wherein the openings have a size of at least about 8 inches by 8 inches.

7. The solid oxide fuel cell stack of claim 1, wherein the anode side frame has a groove formed on an anode facing side, and wherein the anode side seal is a compliant seal positioned in the groove.

8. The solid oxide fuel cell stack of claim 1, wherein the cathode side seal comprises a substantially flat compliant member.

9. The solid oxide fuel cell stack of claim 8, wherein the anode side frame has a plurality of openings within which anode side seals and fuel cells are positioned, and wherein the cathode side frame and the cathode side seal include openings coinciding with the openings in the anode side frame.

10. The solid oxide fuel cell stack of claim 8, wherein the cathode side frame has a plurality of openings within which fuel cells are positioned, and wherein the anode side frame and anode side seal include openings coinciding with the opening in the cathode side frame.

11. The solid oxide fuel cell stack of claim 1, wherein the anode side frame and the cathode side frame further comprise slots for allowing flow of reactants to the fuel cell.

12. The solid oxide fuel cell stack of claim 11, wherein the anode side frame and the cathode side frame have openings within which fuel cell elements are positioned, and wherein the slots are positioned around the openings.

13. The solid oxide fuel cell stack of claim 1, further comprising cooling fluid channels in the anode side frame and the cathode side frame.

14. The solid oxide fuel cell stack of claim 13, wherein the fuel cell stack is adapted to carry out endothermic processes in the cooling fluid channels.

15. The solid oxide fuel cell stack of claim 1, wherein the cathode side seal includes a floating seal.

16. The solid oxide fuel cell stack of claim 1, wherein the anode side seal includes a floating seal.

17. A solid oxide fuel cell stack formed of repeating cell units, each cell unit comprising:

    a solid oxide fuel cell having an anode side and a cathode side;

    an anode side frame;

    a cathode side frame;

a bipolar plate having an anode side interconnect adjacent to the anode side frame and a cathode side interconnect adjacent to a cathode side frame of an adjacent repeating cell unit;

a cathode side seal between the fuel cell and the cathode side frame; and

an anode side seal between the fuel cell and the anode side frame, wherein at least one pair of the anode side interconnect and anode side seal, and cathode side interconnect and cathode side seal are compliant.